

May 19, 2000

Mr. J. A. Scalice
Chief Nuclear Officer and
Executive Vice President
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, Tennessee 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 1 - REQUEST FOR ADDITIONAL
INFORMATION REGARDING RELIEF REQUEST ISPT-08, INSULATION
REMOVAL FOR BOLTED CONNECTIONS FOR VT-2 EXAMINATION
(TAC NO. MA8568)

Dear Mr. Scalice:

By letter dated March 23, 2000, Tennessee Valley Authority (licensee), submitted to the U.S. Nuclear Regulatory Commission (NRC), Relief Request ISPT-08 for the Watts Bar Nuclear Plant, Unit 1 (WBN). The request addressed the need for visual examination of bolted connections inside the polar crane wall. Specifically, the licensee requested relief from the requirement of American Society of Mechanical Engineers, Section XI, Subarticle Paragraph IWA-5242(a), which states, "For systems bolated for the purpose of controlling reactivity, insulation shall be removed from the pressure retaining bolted connections for visual examination VT-2." The licensee proposed to perform the VT-2 of systems that have bolted connections, fabricated from boric acid corrosion resistant materials, without the insulation removed for systems bolated for the purposes of controlling reactivity.

The NRC staff has reviewed the WBN submittal, and has identified additional information, as discussed in the enclosure, that is needed to complete its review. Based on discussions with your staff on May 11, 2000, we understand that your response to this request can be submitted within 60 days of receipt of this letter.

Sincerely,

/RA/

Robert E. Martin, Senior Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-390

Enclosure: Request for Additional Information

cc w/enclosure: See next page

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REQUEST FOR ADDITIONAL INFORMATION

WATTS BAR NUCLEAR PLANT, UNIT 1

1.0 INTRODUCTION

American Society of Mechanical Engineers, Section XI, 1989 Edition, Paragraph IWA-5242 (a) states, "For systems borated for the purpose of controlling reactivity, insulation shall be removed from the pressure retaining bolted connections for visual examination VT-2." Tennessee Valley Authority, the licensee for Watts Bar, has requested relief under Title 10, *Code of Federal Regulations*, Part 50, Section 55a(a)(3)(ii), to perform the VT-2 of systems that have bolted connections, fabricated from boric acid corrosion resistant materials, without the insulation removed for systems borated for the purposes of controlling reactivity.

The U.S. Nuclear Regulatory Commission (NRC) staff has developed a position over the years on the use of AISI Type 17-4 precipitation hardened (PH) stainless steel (SA-564 Grade 630), AISI Type 410 stainless steel (SA-194 Grade 6), and A-286 stainless steel (SA-453 Grade 660) bolted connections. The 17-4 PH stainless steel and the 410 stainless steel are suitable for use in contact with primary water if they are aged at a temperature of 1100 °F or higher. If they are aged at a lower temperature, they become susceptible to primary water stress corrosion cracking. The hardness of these alloys should be below R_c 30 if they are properly heat treated. A-286 stainless steel is susceptible to stress corrosion cracking in primary water, particularly if preloaded above 100 ksi.

Bengtsson and Korhonen of ASEA-ATOM, Vasteras, Sweden, examined the behavior of A-286 in a BWR environment as reported in the Proceedings of the International Symposium on Environmental Degradation of Materials in Nuclear Power Systems-Water Reactors, August 22-25, 1983, Myrtle Beach, South Carolina, sponsored by National Association of Corrosion Engineers, the Metallurgical Society of AIME, and the American Nuclear Society. They found the A-286 in comparison to other tested materials, was the most susceptible material they tested to intergranular stress corrosion cracking in BWR water. They also found that A-286 is less likely to crack as the applied stress is reduced. Piascik and Moore from Babcock & Wilcox reported a number of vessel internals bolt failures of A-286 bolts in PWR water in *Nuclear Technology*, Vol. 75, December 1986. They correlated the failures with bolt fillet peak stress and found that bolts preloaded below 100 ksi showed no failures.

The staff position is that any 17-4 PH stainless steel or 410 stainless steel stud, bolt, or nut aged at a temperature below 1100 °F or with hardness above R_c 30 must have the thermal insulation removed for VT-2 examination during the system pressure test. For A-286 stainless steel studs or bolts, the preload must be verified to be below 100 ksi or the thermal insulation must be removed and the joint visually inspected. For A-286 nuts, experience indicates it would not be necessary to remove the thermal insulation for visual inspection.

Code Case N-616 does not address the possibility that 17-4 PH stainless steel, 410 stainless steel, or A-286 bolted connections could fail in service under insulation and the failure could go unnoticed. In addition, all valve bodies, pump casings, and piping must contain at least 10 percent chromium and be in the proper heat treatment condition because the insulation

ENCLOSURE

could create an autoclave and materials with less than 10 percent chromium could experience high corrosion rates that could go unnoticed. Also, the code case does not specifically require the 4-hour hold time at operating temperature and pressure prior to conducting the VT-2 examination.

Provide the following information regarding the Watts Bar relief request:

- (a) heat treatment of any SA-194 Grade B6 (410 stainless steel) bolting
- (b) preload on SA-453 Grade 660 (A-286) bolted connections
- (c) chromium content of the piping, pump casings, and valve bodies that are under the insulation
- (d) the hold time that will be imposed at operating temperature and pressure prior to conducting the VT-2 examination

Mr. J. A. Scalice
Tennessee Valley Authority

WATTS BAR NUCLEAR PLANT

cc:

Mr. Karl W. Singer, Senior Vice President
Nuclear Operations
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Paul L. Pace, Manager
Licensing and Industry Affairs
Watts Bar Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Spring City, TN 37381

Mr. Jack A. Bailey, Vice President
Engineering & Technical
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. William R. Lagergren, Plant Manager
Watts Bar Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Spring City, TN 37381

Mr. Richard T. Purcell, Site Vice President
Watts Bar Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Spring City, TN 37381

Senior Resident Inspector
Watts Bar Nuclear Plant
U.S. Nuclear Regulatory Commission
1260 Nuclear Plant Road
Spring City, TN 37381

General Counsel
Tennessee Valley Authority
ET 10H
400 West Summit Hill Drive
Knoxville, TN 37902

Rhea County Executive
375 Church Street
Suite 215
Dayton, TN 37321

Mr. N. C. Kazanas, General Manager
Nuclear Assurance
Tennessee Valley Authority
5M Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

County Executive
Meigs County Courthouse
Decatur, TN 37322

Mr. Mark J. Burzynski, Manager
Nuclear Licensing
Tennessee Valley Authority
4X Blue Ridge
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Lawrence E. Nanney, Director
Division of Radiological Health
Dept. of Environment & Conservation
Third Floor, L and C Annex
401 Church Street
Nashville, TN 37243-1532

Ms. Ann Harris
305 Pickel Road
Ten Mile, TN 37880